A 3D culture system enhances the ability of human bone marrow stromal cells to support the growth of limbal stem/progenitor cells.

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Public Summary:
The standard method of cultivating limbal epithelial progenitor/stem cells (LSCs) on a monolayer of mouse 3T3 feeder cells possesses the risk of cross-contamination in clinical applications. Human feeder cells have been used to eliminate this risk; however, efficiency from xenobiotic-free cultures on a monolayer appears to be lower than in the standard method using 3T3 cells. We investigated whether bone marrow stromal cells (BMSCs), also known as bone marrow-derived mesenchymal stem cells, could serve as feeder cells for the expansion of LSCs in the 3-dimensional (3D) system. Primary single human LSCs on a monolayer of 3T3s served as the control. Very poor growth was observed when single LSCs were cultured on BMSCs. When LSC clusters were cultured on a BMSC monolayer (CC-BM), 3D culture system (3D CC-BM) and fibrin 3D system (fibrin 3D CC-BM), the 3D CC-BM method supported a greater LSC expansion. The 3D CC-BM system produced a 2.5-fold higher cell growth rate than the control ($p<0.05$). The proportion of K14(+) and p63alpha(bright) cells was comparable to those in the control ($p>0.05$), whereas the proportion of K12(+) cells was lower ($p<0.05$). These results indicate that BMSCs can efficiently support the expansion of the LSC population in the 3D culture.

Scientific Abstract:
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